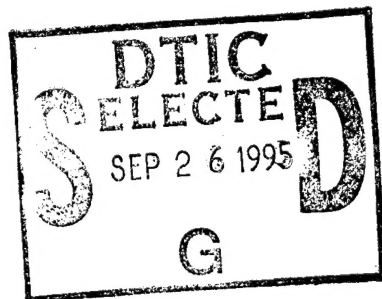


# DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE LITHIUM-ION BATTERY



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NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

Contract # N00014-94-C-0141  
ARPA Order # 9332004arp01/13 APR 1994/313ES

R & D Status Report #2

Reporting Period: 16th November to 15th December, 1994

Submitted by:

The Electrofuel Manufacturing Company Inc.

DTIC QUALITY INSPECTED 3

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DISTRIBUTION STATEMENT A

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Feb 1, 1995

IN REPLY  
REFER TO

DTIC-OCC

SUBJECT: Distribution Statements on Technical Documents

TO: Office of the Chief of Naval Research  
800 north Quincy Street  
Arlington, VA 22217-5000  
Code 22

1. Reference: DoD Directive 5230.24, Distribution Statements on Technical Documents, 18 Mar 87.

2. The Defense Technical Information Center received the enclosed report (referenced below) which is not marked in accordance with the above reference.

R&D Status report  
N00014-94-C-0141

3. We request the appropriate distribution statement be assigned and the report returned to DTIC within 5 working days.

4. Approved distribution statements are listed on the reverse of this letter. If you have any questions regarding these statements, call DTIC's Cataloging Branch, (703) 274-6837.

FOR THE ADMINISTRATOR:

1 Encl

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Chief, Cataloging Branch

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Controlling DoD Office).

The cited documents has been reviewed by competent authority and the following distribution statement is  
hereby authorized.

<u>A</u> (Statement)	OFFICE OF NAVAL RESEARCH CORPORATE PROGRAMS DIVISION ONR 353 800 NORTH QUINCY STREET ARLINGTON, VA 22217-5660	_____ (Controlling DoD Office Name)
_____ (Reason)	DEBRA T. HUGHES DEPUTY DIRECTOR CORPORATE PROGRAMS OFFICE	_____ (Controlling DoD Office Address, City, State, Zip)
<u>Debra T. Hughes</u> (Signature & Typed Name)	_____ (Assigning Office)	15 SEP 1995 (Date Statement Assigned)

# DEVELOPMENT OF AN ULTRA-SAFE RECHARGEABLE LITHIUM-ION BATTERY

## R&D STATUS REPORT 1931-1002/0

ARPA Order No.: 9332004arp01/13APR1994/313ES  
Program Code No.: ARPA-BAA93-32  
Contractor: The Electrofuel Manufacturing Company Inc.  
Contract No.: N00014-94-C-0141 Contract Amount: \$1271728.  
Effective Date of Contract: August 15, 1994  
Expiration Date of Contract: February 14, 1996  
Principal Investigator: J.K. Jacobs  
Telephone No.: (800) 388-2865  
Short Title of Work: Lithium-ion Battery Development  
Reporting Period: November 16, 1994 to December 15, 1994

### Description of Progress:

The work continued in a number of areas, however particular focus was on two central issues:

1. Verification of bonding procedures for inter-electrode and intra-electrode bonding using a series of fluorinated vinyl copolymers as adhesives/ion-conductors. These are plasticized with organic carbonates typical of the electrolyte (eg. EC, DEC) to improve both flexibility and ion conductivity. Two procedures appear to be equally effective. These are:

- a. Coating with water based latex slurry followed by air drying and hot pressing/laminating.

- b. Solution casting, from ketone solvents, of a slurry or interlayer followed by hot air drying and "warm" laminating. Manufacturability considerations will dictate the method of choice.

2. Design of the flexible manufacturing line is further advanced than had been expected at this time, with fabrication of prototype web-handling equipment (coater, laminator, drier, and associated ancillaries) having started. Specifications of the motor/controller and gear reducer system for the web drive of the prototype battery production machine have also been completed. This step allows ordering of all major components of the flexible battery manufacturing line to proceed.

Change in Key Personnel: None

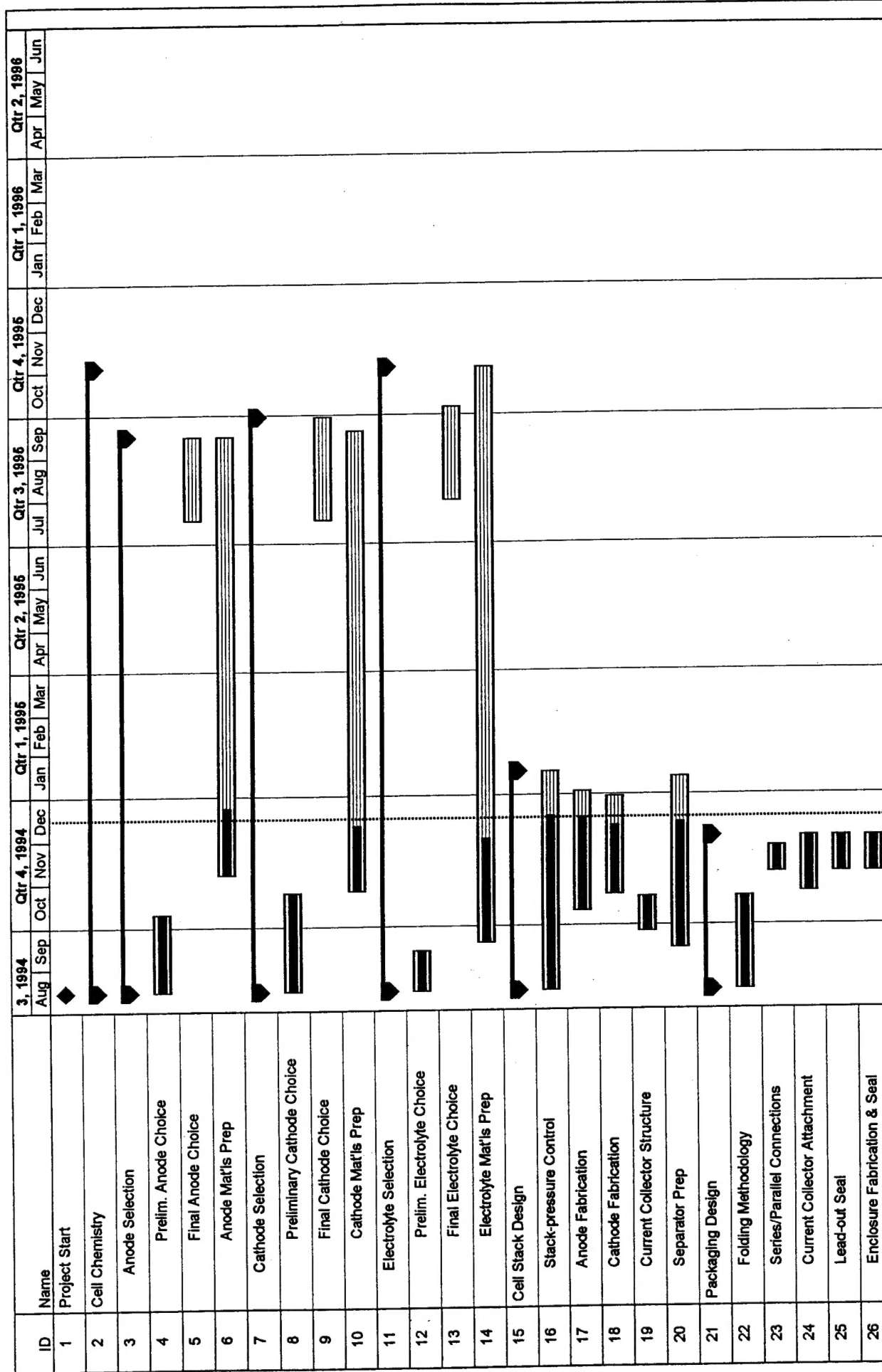
Summary of Substantive Information Derived from Special Events:  
None:

Problems Encountered and/or Anticipated: None

Action Required by the Government: None

Fiscal Status:

	Total Est- imate of Program	US Govt Funding Obliga- tion	Electro fuel Contri- bution
(1) Amt. currently provided on contract:	\$1630421	\$1271728	\$358693
(2) Expenses & commitments to date:	\$ 170419	\$ 132927	\$ 37492
(3) Funds required to complete work:	\$1460002	\$1138801	\$321201



Project: LI-Ion Battery  
 Date: 12/23/94

ID	Name	3, 1994			Qtr 4, 1994			Qtr 1, 1995			Qtr 2, 1995			Qtr 3, 1995			Qtr 4, 1995			Qtr 1, 1996			Qtr 2, 1996		
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
27	Charger Design																								
28	Safety Requirements Review																								
29	Safety Protection Design																								
30	Equalization																								
31	Rate Control																								
32	User-group Input																								
33	User Input - part I																								
34	User Input - part II																								
35	User Input - part III																								
36	Flexible Manufacturing Line Design																								
37	Prototype Equipment Design																								
38	Pilot Equipment Design																								
39	Misc. Unit Op.'s Equip. Design																								
40	Flexible Manufacturing Line Setup																								
41	Prototype Line Setup																								
42	Pilot Line Setup																								
43	Battery Fabrication																								
44	Button Cell																								
45	Hand-crafted Cell																								
46	Prototype Battery A: Credit Card																								
47	Prototype Battery B: Lap Top																								
48	Prototype Battery C: B5590																								
49	Battery Testing																								
50	Button Cell Performance																								
51	Hand-crafted Performance																								
52	Prototype Safety																								



Project: Li-Ion Battery  
 Date: 12/23/94

ID	Name	3, 1994			Qtr 4, 1994			Qtr 1, 1995			Qtr 2, 1995			Qtr 3, 1995			Qtr 4, 1995			Qtr 1, 1996			Qtr 2, 1996		
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
53	Prototype Performance																								
54	Reporting																								
55	Progress																								
56	Button Cell Report																								
57	Prototype Battery Test Report																								
58	Final Report																								
59	Project Complete																								

<

Critical

Noncritical

Progress

Milestone

Summary

Rolled Up

Project: Li-Ion Battery  
Date: 12/23/94